



Original research article

Tearing down the information barrier: the price impacts of energy efficiency ratings for buildings in the German rental market



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ABSTRACT

Improving the energy efficiency levels of the housing stock is of particular concern in the private rental market where capital costs and utility cost savings are not shared in equal measure by landlords and tenants. This problem is particularly pronounced in the German housing market with its predominance of rented accommodation over owner occupancy. The present study is the largest to date to investigate the effect of energy efficiency ratings on rental values. Using a semiparametric hedonic model and an empirical sample of nearly 760 thousand observations across 403 local markets in Germany with full hedonic characteristics, we find evidence that energy-efficient rental units are rented at a premium. However, this effect is not confirmed for the largest metropolitan housing markets. In a second step, a survival hazard model is estimated to study the impact of the energy ratings on time-on-market. It is found that energy inefficient dwelling have longer marketing periods and are hence less liquid than their more energy efficient counterparts.

1. Introduction

The building sector is crucial for climate change mitigation goals as it accounts for a large fraction of CO₂ emissions in developed economies. One of the principal policies implemented in the European Union is the 2010 Energy Performance of Buildings Directive along with the 2012 Energy Efficiency Directive which stipulate the use of Energy Performance Certificates (EPC) for revealing the expected energy consumption of a building to prospective buyers and tenants. While EPCs throughout the European Union are part of a broader strategy to increase the mandatory energy efficiency requirements for buildings at both the European and national levels, they are primarily designed to increase the environmental awareness of market participants and enhance the transparency of property transactions with regard to energy consumption [1,2]. The legislative implementation of EPCs has not been homogenous across EU members and compliance rates vary across countries and regions.

EPCs have received rather mixed reviews in the policy assessment literature. While it is generally acknowledged that they fill an important gap in the provision of energy efficiency information, empirical studies indicate that their effectiveness is limited, because they are not made available or are being ignored or their implications for household finances are not understood by buyers. These limitations are confirmed

empirically by a number of studies, for example by Murphy [3] who found EPCs to have only a weak influence pre and post-purchase in the Netherlands and Amecke [4] who arrived at the same conclusion in his study of Germany, citing limitations in design, legal status and overall low importance of energy efficiency as the main reasons.

Despite these limitations, it appears that the EPC was at least partially successful in mitigating information asymmetry in the marketplace and that information provision has improved over time. Lack of information about energy consumption patterns and energy efficiency measures has been identified previously as a major barrier to energy efficiency in empirical studies on Germany [5]. Additionally, the information conveyed by the disclosure of dwelling energy efficiency has arguably also played a supportive role in the ‘greening’ of the existing housing stock via energy efficiency retrofits that many government agencies in the European Union have sought to promote. The EPC provides a tool for estimating baseline and post-retrofit energy efficiency levels but may also have contributed in more indirect ways by strengthening public awareness of energy efficiency in buildings.

Making information provision compulsory in real estate markets creates – from a microeconomic point of view – a new information set for landlords and tenants which in turn affects rent formation. While EPCs are generally compulsory for landlords when leasing and selling residential properties, they are primarily intended for buyers and

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tenants, which leads to diverging information sets and rental expectations. The latter arises whenever the expected marginal willingness to pay for energy efficiency by the tenant differs from the expected marginal rent premium asked by the landlord. And since EPCs aim at anchoring the energy efficiency awareness in the decision making process of both parties, the benefits might be reflected in a stronger willingness to pay for energy efficient assets. In other words, EPCs might lead to a simultaneous increase in the marginal utility function of both parties. In the longer run, this may also entail lower equilibrium rents for assets with poor environmental performance and thus to elevated refurbishment levels in the residential stock.

This paper explores the mechanism by which energy efficiency is capitalised into residential rents using market evidence from Germany. It estimates both the willingness to pay for energy efficiency and the liquidity of energy efficient assets relative to their less efficient counterparts. By interrogating one of the largest real estate databases in Germany supplemented with information on EPCs (*Energieausweise*), we empirically estimate the energy premium as well as the liquidity premium. Finally, we construct residential property rental indices to study the impact of EPCs when creating value in institutional portfolios.

This paper is organised as follows. We first position the current study in the existing literature, provide some background on the EPC in the German context and review the split incentive problem as a major obstacle towards achieving higher energy efficiency of the rental stock. The following sections then describe our research approach and econometric models, followed by a description of the data, presentation of results and finally a discussion of the implications with a view towards deriving policy recommendations.

2. Previous research

Recent empirical research has provided evidence for the existence of an energy efficiency premium across European residential markets. First evidence on green market effects was found in the Netherlands by Brounen and Kok [6] and Kok and Jennen [7] with subsequent empirical studies carried out in several European countries: Germany [8,9], England [10], Wales [11,12], Finland [11,12], Ireland [13], Portugal [14], Spain [15], among others. Additionally [11,12],) find sale prices premiums for high EPC-rated buy-to-let properties with premiums of 18.5% and 4% for A/B and C-rated properties respectively (relative to D-rated properties). However, no significant discount for F/G-rated buy-to let properties was found. The authors attribute this to the split incentive problem, i.e. landlords base their willingness to invest in energy efficiency on achievable rental values which are net of utility costs as these are typically covered by tenants.

The notion that energy efficiency may be rewarded by real estate markets has not only caused landlords and tenants to pay more attention to this dimension but has also shaped the emergence of green investment and portfolio strategies by institutional investors (e.g. Deutsche Bank, MSCI or SEB). However, while the first official evaluation report by the European Commission on the impact of EPCs in real estate markets confirms a general statistical green energy premium effect on real estate prices and rents [16], two caveats seem in order. Firstly, the evaluation report focusses primarily on countries with highly owner-occupied residential markets such as Belgium, Ireland and the United Kingdom. Secondly, it highlights the large variations in the green premium effect between and within the observed countries, mainly ascribed to macroeconomic and legislative differences as well as local market conditions and/or regional factors.

Hence, the green premium in the German residential market might differ significantly from other European countries due to the low ownership rate and the strong polycentric distribution of urban centres and consequently the importance of regional factors. There are two main studies of the impact of EPCs on the German residential market: While [8], find a rent premium of ca. 1.7% based on 2600 observations, [9], focus on the capitalisation effects in Berlin's residential market for

150,000 observations and find evidence that energy efficiency is capitalised in apartment prices although they also report that the value of energy cost savings is not matched by the implicit willingness to pay of tenants.

Moreover, energy efficient dwellings may also be more liquid and have shorter marketing periods. Liquidity in the context of energy efficiency in the residential market has hitherto remained largely unexplored in the literature, a gap that the present study seeks to fill. There are a number of existing studies that have explored time on market (TOM) empirically and conceptually. Most of these studies report a positive relationship between list price and TOM [17,18] with a divergent finding being reported by Kang and Gardner [19] who find a negative correlation. Moving beyond the bid-ask spread argument, Haurin [20] uses search theory to demonstrate that TOM is longer where a large range of offers exist and shorter where the bids of prospective buyers are of a similar order of magnitude. Non-standard properties and/or sellers are more likely to elicit a larger range of bids as the fair property value may be harder to determine and sellers may provide information differently to the marketplace and through different channels [21–23]. In the context of this study, we expect that energy efficient dwellings exhibit smaller variation than their non-efficient counterparts as they have to conform to certain norms to achieve a high rating. It may also be expected that the owners of these dwellings are generally more up-to-date with building requirements and standards and may hence also take a more professional approach in marketing their properties than the owners of non-efficient buildings.

3. Regulatory characteristics of EPCs in Germany

The regulations pertaining to EPCs were initially laid out in the German Energy Savings Act (EnEV) which stipulates that all residential buildings require an EPC whenever a sales or rental transaction occurs. The seller or landlord is obliged to provide a copy of the EPC to the buyer or tenant upon request. An important characteristic of the German EPC compared to how the EU directive was implemented in other member states is that it combines the inspection-based intrinsic evaluation system with a consumption-based system. Most other EU countries have opted for only one of these two systems. The energy demand certificate (Bedarfsausweis) is based on an accredited expert's opinion of the energy efficiency of a building after an inspection of roof and wall insulation, heating and electricity systems, etc. By contrast, the energy usage certificate (Verbrauchsausweis) is based on actual meter readings and utility bills over the past three years. The energy demand certificate is considerably costlier (around €500) than the usage certificate and is legally required unless the building is (a) a multi-apartment building with more than four units or (b) built to more recent (post-1977) standards. The EPC measures or estimates the energy required for heating and distinguishes between primary energy demand and final energy demand. This distinction is relevant as some heating systems, for example electric heating, do not generate emissions on-site when the property is heated but still have an unfavourable emissions profile when emissions in energy generation in coal power plants etc are taken into account.

While this dual approach to the EPC has its advantages in terms of flexibility towards particular types of dwellings and ownership constellations, it also has its drawbacks, notably in the comparability of ratings across dwellings and providing the consumer with clear and comprehensible information. The use of the consumption-based usage certificate is also limited by the fact that consumption is strongly dependent on the individual behaviour of occupants which may or may not be indicative of the expected bills of the prospective tenants or owners. Hence, future tenants may discount the information value of a consumption-based EPC as it may have low predictive power for the utility bills to be expected by these new tenants. Likewise, the intrinsic energy demand EPC may be discounted as it is not derived from actual consumption.

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